# Nonoxynol 9

## Drug Description

Nonoxynol 9 is a nonionic surfactant used as a spermicide. [1]

## HIV/AIDS-Related Uses

Nonoxynol 9 is not approved for the prevention or treatment of HIV infection. Although Nonoxynol 9 has some in vitro activity against HIV-1, studies have shown that it has no protective effect in vivo. Rather, repeated nonoxynol 9 use has been associated with increased incidence of genital lesions that may cause increased transmission of HIV-1. [2] [3]

## Non-HIV/AIDS-Related Uses

Nonoxynol 9 is approved for use as a vaginal spermicide. Vaginal spermicides, in combination with mechanical barrier methods of contraception, are used to prevent pregnancy.[4]

The use of vaginal spermicides in combination with latex condoms may be partially effective in reducing the risk of acquiring some sexually transmitted diseases (STDs). In vitro studies have shown nonoxynol 9 to decrease the infectivity of Treponema pallidum and inhibit the growth of Chlamydia trachomatis, Gardnerella vaginalis, Mycoplasma hominis, Neisseria gonorrhoeae, Trichomonas vaginalis, and Ureaplasma urealyticum. Clinical studies have shown a reduction in the rate of occurrence of chlamydia, trichomoniasis, and bacterial vaginosis with the use of nonoxynol 9-containing preparations, especially in combination with mechanical barrier contraceptives.[5] Vaginal spermicides, in combination with mechanical barrier contraceptives, decrease the risk of development of pelvic inflammatory disease and subsequent tubal damage and infertility. Vaginal spermicides may reduce the incidence of cervical neoplasia. However, the nature and extent of this reduction in incidence has not yet been clearly documented.[6]

## Pharmacology

Nonoyxnol 9 forms a chemical barrier between the vaginal mucous membranes and ejaculate.By interacting with the lipoproteins of the cell membranes, nonoxynol 9 severely damages the acrosome, neck, midpiece, and tail of sperm. This leads to rapid, irreversible loss of sperm function, motility, and viability within the vagina. Studies also indicate that carbohydrate-metabolizing enzymes and the mitochondriae of sperm are disturbed. Additionally, the inactive vehicle itself may form a mechanical barrier to the cervical os, inhibiting the passage of sperm. Nonoxynol 9 also disrupts vaginal epithelial cells. Increased thinning of the epithelium occurs with continuing exposure.[7] In animal studies, nonoxynol 9 was rapidly and extensively absorbed from the vaginal mucosa into the systemic circulation. The rate of absorption is dependent upon the product vehicle. Foam spermicidal products have the highest degree of dispersion within the vagina and adherence to the mucosa, followed by creams, gels and jellies, and suppositories and films. In animal studies, nonoxynol 9 distributed primarily to the uterus, vaginal tissue, and liver. There is little evidence that nonoxynol 9 is metabolized.[8]

Nonoxynol 9 is excreted in both the urine and feces. Rates of excretion are highly dependent on the animal being studied. Human studies have not been performed to document excretion.[9]

Patients allergic to nonoxynol 9 are likely to be allergic to octoxynol 9 and should avoid further use of either product if an allergic reaction occurs.[10]

Nonoxynol 9 has not been shown to increase the risk of occurrence of spontaneous abortion or major congenital anomalies when used at or near the time of conception or during pregnancy.[11]

## Adverse Events/Toxicity

Adverse effects that may require medical attention include allergic vaginitis, contact dermatitis, and urinary tract infections.[12]

## Drug and Food Interactions

Drug interactions may occur when nonoxynol 9 is used in combination with vaginal or topical agents,

# Nonoxynol 9

## Drug and Food Interactions (cont.)

including, but not limited to, vaginal douches and rectal or vaginal cleansing products.[13]

## Clinical Trials

For information on clinical trials that involve Nonoxynol 9, visit the ClinicalTrials.gov web site at http://www.clinicaltrials.gov. In the Search box, enter: Nonoxynol 9 AND HIV Infections.

## Dosing Information

Mode of Delivery: Nonoxynol 9 is available as a vaginal cream, vaginal film, vaginal foam, vaginal gel, vaginal jelly, and vaginal suppositories. Most preparations may be used alone or with concurrent use of a diaphragm.[14]

Dosage Form: Nonoxynol 9 is available in over-the-counter preparations that range in strength from 2% to 28%.[15]

Storage: Store below 40 C (104 F), preferably between 15 and 30 C (59 and 86 F), in a well-closed container, unless otherwise specified by manufacturer. Protect from freezing.[16]

## Chemistry

CAS Name: Poly(oxy-1,2-ethanediyl), a-(4-nonylphenyl)-w-hydroxy-[17]

CAS Number: 26571-11-9[18]

Molecular formula: C33-H60-O10[19]

Molecular weight: 617[20]

Melting point: pour point 37 +/- 2 C[21]

Physical Description: Nonoxynol 9 is an almost colorless liquid.[22]

Solubility: Nonoxynol 9 is soluble in water, ethanol, ethylene glycol, ethylene dichloride, xylene, and corn oil. It is insoluble in Stoddard solution, deodorized kerosene, and low viscosity white mineral oil.[23]

## Other Names

Nonaethylene glycol mono(nonylphenyl) ether[24]

Nonaethylene glycol nonylphenyl ether[25]

Nonoxynol-9[26]

Nonylphenol octa(oxyethylene) ethanol[27]

PEG-9 Nonyl phenyl ether[28]

Polyethylene glycol 450 nonyl phenyl ether[29]

Polyoxyethylene (9) nonyl phenyl ether[30]

## Further Reading

Wilkinson D, Tholandi M, Ramjee G, Rutherford GW. Nonoxynol-9 spermicide for prevention of vaginally acquired HIV and other sexually transmitted infections: systematic review and meta-analysis of randomised controlled trials including more than 5000 women. Lancet Infect Dis 2002 Oct;2(10):613-7.

Van Damme L, Ramjee G, Alary M, Vuylsteke B, Chandeying V, Rees H, Sirivongrangson P, Mukenge-Tshibaka L, Ettiegne-Traore V, Uaheowitchai C, Karim SS, Masse B, Perriens J, Laga M; COL-1492 Study Group. Effectiveness of COL-1492, a nonoxynol-9 vaginal gel, on HIV-1 transmission in female sex workers: a randomised controlled trial. Lancet 2002 Sep 28;360(9338):971-7.

Krebs FC, Miller SR, Malamud D, Howett MK, Wigdahl B. Inactivation of human immunodeficiency virus type 1 by nonoxynol-9, C31G, or an alkyl sulfate, sodium dodecyl sulfate. Antiviral Res. 1999 Oct;43(3):157-73.

## For More Information

Contact your doctor or an AIDSinfo Health Information Specialist:

• Via Phone: 1-800-448-0440 Monday - Friday, 12:00 p.m. (Noon) - 5:00 p.m. ET

• Via Live Help: http://aidsinfo.nih.gov/live_help

## For More Information (cont.)

Monday - Friday, 12:00 p.m. (Noon) - 4:00 p.m. ET

## References


1. Merck Index - 2001; p.1196

2. Lancet - 2002 Sep 28;360(9338):971-7.

3. Lancet Infect Dis - 2002 Oct;2(10):613-7.

4. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

5. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

6. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

7. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

8. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

9. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

10. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

11. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

12. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

13. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

14. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 28, 2003.

15. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 28, 2003.

16. USP DI (Website) - Available at: http://healthcare.micromedex.com. Accessed: April 24, 2003.

17. USP Dictionary of USAN & Intern. Drug Names - 2002; p. 622

18. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/. Accessed April 24, 2003.

19. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/. Accessed April 24, 2003.

20. Merck Index - 2001; p. 1196

21. Merck Index - 2001.; p. 1196

22. Merck Index - 2001; p.1196

23. Merck Index - 2001; p.1196

24. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/detail_frame.html?DetailIndex=1&DetailCount=1. Accessed: April 30, 2003.

25. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/detail_frame.html?DetailIndex=1&DetailCount=1. Accessed: April 30, 2003.

26. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/detail_frame.html?DetailIndex=1&DetailCount=1. Accessed: April 30, 2003.

27. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/detail_frame.html?DetailIndex=1&DetailCount=1. Accessed: April 30, 2003.

28. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/detail_frame.html?DetailIndex=1&DetailCount=1. Accessed: April 30, 2003.

29. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/detail_frame.html?DetailIndex=1&DetailCount=1. Accessed: April 30, 2003.

30. ChemIDplus. - Available at: http://chem.sis.nlm.nih.gov/chemidplus/detail_frame.html?DetailIndex=1&DetailCount=1. Accessed: April 30, 2003.